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A SIMPLE MICROPROJECTOR

By S. W. Simmons, Division of Insects Affecting Man and Animals

Field workers at times find themselves in need of a method for reproducing images of small specimens mounted on slides when usual manufactured devices for this purpose are not readily obtainable. In such instances a monocular compound microscope can be made to serve as a microprojector by fitting it with the simple mirror attachment described herein. This attachment can be made at very little expense, and the necessary materials are usually available.

The apparatus consists essentially of a mirror so mounted near the ocular of the microscope that the image is reflected downward on a piece of paper.

The materials needed are as follows:

(1) One mirror of as nearly optically correct glass as possible, approximately 1 by 1 inch. (Optically correct glass is needed, otherwise the image will be distorted.)
(2) Metal frame for mirror.
(3) One metal bar about 3 inches long, 1/2 inch wide, and 1/16 inch thick.
(4) One strip of spring steel or brass, approximately 3/4 inch wide and about $2\frac{3}{4}$ inches long.
(5) Solder.

Figure 1 shows construction and assemblage of the apparatus. One end of the metal bar is soldered to the back of a piece of thin sheet copper, brass, or tin. This piece of metal should be about 1/4 inch greater on all sides than the mirror. The mirror is then placed on the metal, face upward, on the side opposite from the metal bar, and the edges of the metal are turned over it to form a rigid frame.

To the opposite end of the bar and about $1\frac{1}{4}$ inches from the mirror a spring clip is soldered as shown in the figure. This clips over the draw tube of the microscope and holds the apparatus firmly in place. It is easily constructed from thin spring brass or steel.

The metal bar is bent so that it places the mirror directly in front of the ocular lens, and at a 45° angle to it.

The apparatus is then clipped on to the draw tube of the microscope, and the instrument is tilted back so that the draw tube is parallel with the table. When a piece of white paper is placed beneath the mirror and the object on the slide is brought into focus the image is reflected on the paper.

The mirror is properly adjusted when the field of light reflected is circular. This can be determined by the use of a compass. Corrections are made by bending the metal bar and turning the apparatus.

It is essential that the source of light be adequate and that the room be darkened. Most medium-priced microscope lamps are probably satisfactory. A small spot light on a universal-jointed mount is convenient, but such lamps are generally not bright enough to use with high-power magnifications. The brighter lamps with large lenses can be used successfully. Scattered light from the lamp must be at a minimum. This can be reduced by placing the large end of a metal funnel over the lens and directing the small end of the funnel on the object. The condenser and mirror of the microscope can be removed or pushed to one side and the light placed close beneath the specimen, care being taken to avoid overheating. Colored glass filters are better removed from the lamp before use.

The magnification varies with the distance of the mirror from the eye lens, with the length of the draw tube, with the distance of the paper from the mirror, and with the ocular and objectives used.

When the center of the mirror is 15 mm from the ocular and the paper is $5\frac{1}{2}$ inches below the mirror, as it is when lying on a table beneath the ocular of the average microscope tilted parallel to the table, a magnification of about 52.5 times can be obtained with a 16-mm objective and a 10× ocular. By pulling out the draw tube the magnification is increased. Extending it 26 mm increases the magnification to 64 times. With large lice, mites, etc., a 32-mm objective is convenient and does not require an especially strong light. A very good light must be used with an objective less than 4 mm.

Specimens reflected in this manner can be traced conveniently. A small mirror as recommended does not interfere with free use of the pencil when drawing.

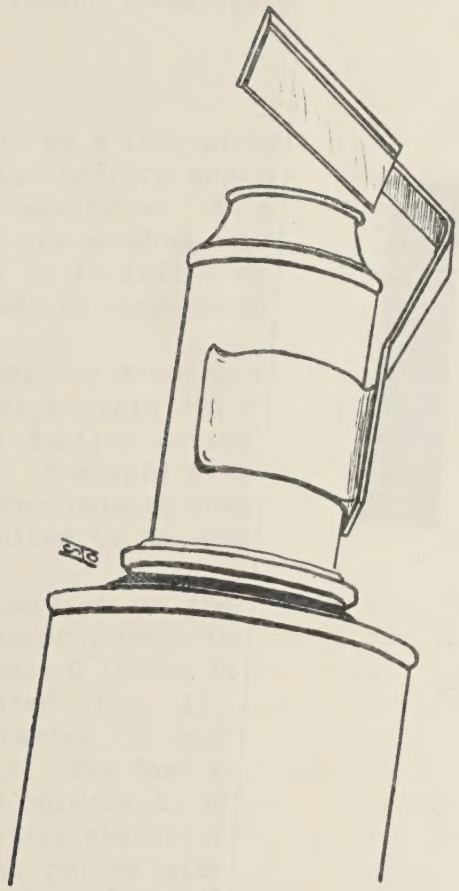

Figure 1.--Mirror attachment for microprojection, assembled for use on a compound microscope. Actual size.